



Ancient antimicrobial resistance in Scarisoara ice cave

V.I., Paun¹; P., Lavin^{2,3}; C., Chifiriuc⁴; C., Purcarea¹



¹Department of Microbiology, Institute of Biology, Bucharest, Romania; ²The Network for Extreme Environment Research (NEXER), Scientific, Universidad de Antofagasta, Antofagasta, Chile; ³Departamento de Biotecnología, Facultad de Ciencias del Mar y Recursos Biológicos, Universidad de Antofagasta, Antofagasta, Chile; ⁴Faculty of Biology and the Research Institute of the University of Bucharest, ICUB, University of Bucharest, Bucharest, Romania.

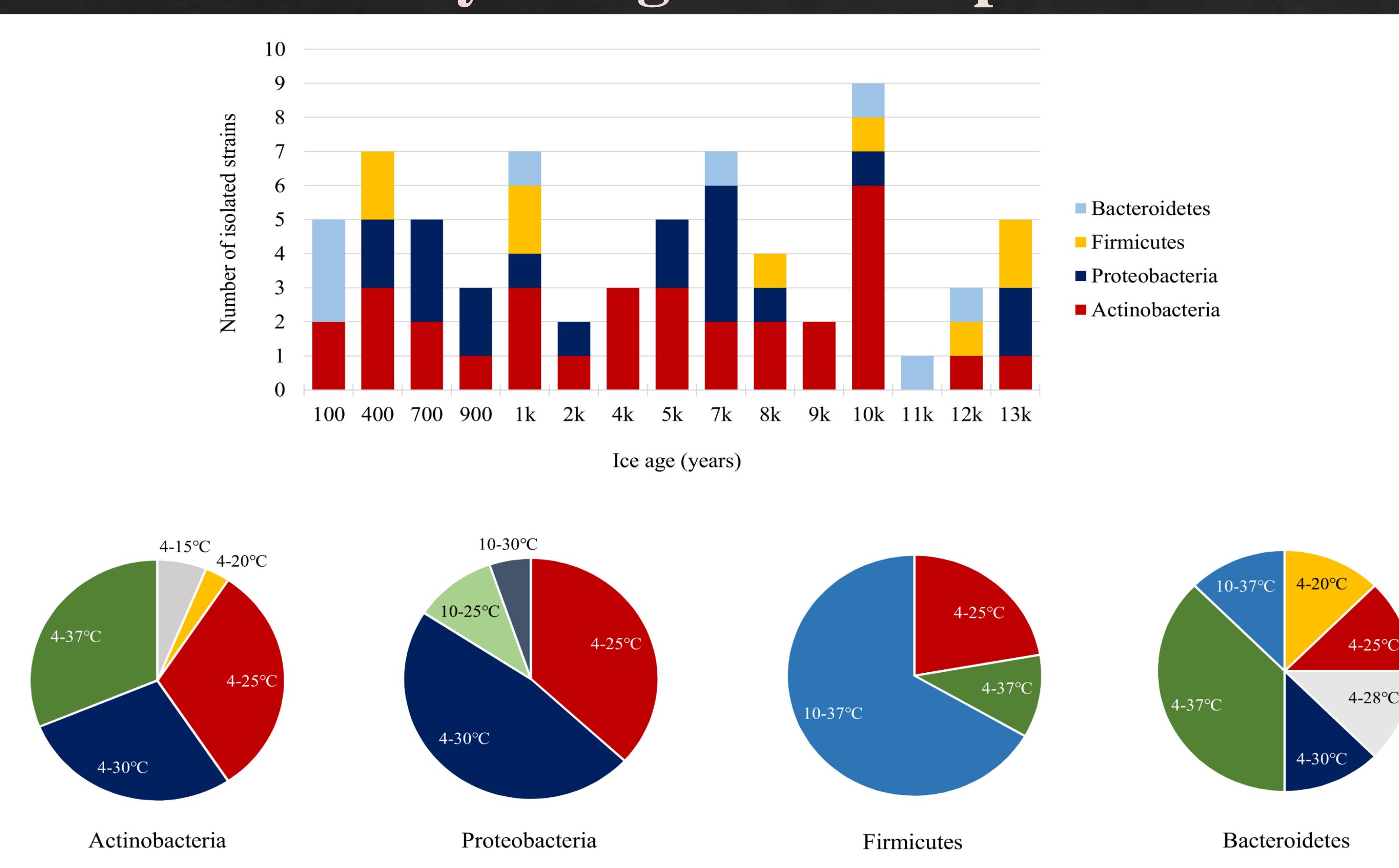
INTRODUCTION

The unique physiology of cold-environment microbiomes constitute promising leads for the discovery of new bioactive compounds, with largely unexplored antibiotic resistance and antimicrobial potential of bacteria isolated from perennial ice caves.

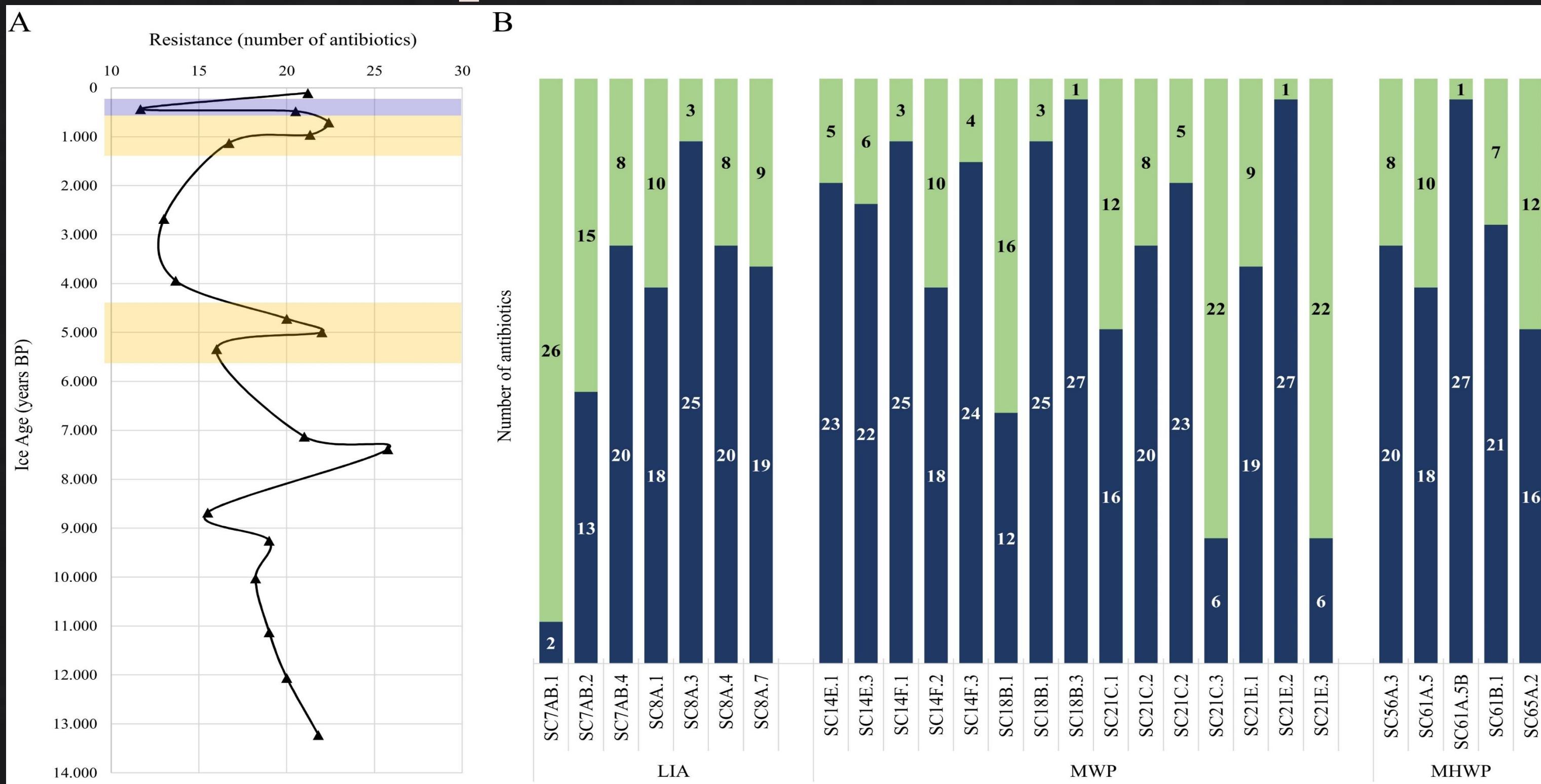
Our study focused on the characterization of bacterial strains isolated from a 13,000-years old ice core chronosequence of Scarisoara Ice Cave, Romania.

The 68 bacterial isolates provided the first isolated bacterial strains from this perennial ice accumulated since Late Glacial period, belonging to Proteobacteria, Actinobacteria, Bacteroidetes and Firmicutes, and the first culture-based evidence of the existence of bacterial resistome and antimicrobial compound production from this type of icy environment.

Taxonomy and growth temperature



Climate impact on antimicrobial resistance



Scarioara Ice Cave



Antimicrobial activity

Test pathogen	Cave isolates										
	SC1A.5	SC7AB.1	SC8A.3	SC61A.5	SC61A.5B	SC71.5	SC86E.3	SC86E.4	SC97A.1	SC97A.2	
<i>Staphylococcus aureus</i> ATCC 25923	+	+	+	+	+	+	+	+	+	+	
<i>Escherichia coli</i> ATCC 25922	+	+	+	+	+	+	-	+	-	+	
<i>Enterobacter cloacae</i> 19069 ONE2	+	+	-	+	+	+	+	+	+	+	
<i>Enterobacter cloacae</i> 19069 ONE3	+	+	+	+	+	+	+	-	+	+	
<i>Pseudomonas</i> CN11	+	+	+	+	+	+	+	+	+	+	
<i>Pseudomonas aeruginosa</i> 19053 CNE5	-	+	+	+	+	+	+	+	+	+	
<i>Pseudomonas aeruginosa</i> 19053 CNE6	-	-	+	+	+	-	-	-	+	+	
MRSA 19081 F1	+	+	+	+	+	+	+	+	+	+	
<i>Klebsiella</i> 19094 CK1	-	-	-	-	-	+	-	-	-	+	
<i>Klebsiella</i> 19094 CK2	-	-	-	-	+	+	-	-	-	+	
<i>Klebsiella</i> 19094 CK3	-	-	-	-	-	-	-	-	-	+	
<i>Enterococcus falcium</i> 19040 E1	+	-	-	-	-	+	-	-	-	+	
<i>Enterococcus falcium</i> 19040 E2	+	-	-	-	-	+	-	-	-	+	
<i>Enterococcus falcium</i> 19040 E3	+	-	-	-	+	-	-	-	-	+	
Total	9	7	7	8	10	11	8	6	6	7	14

CONCLUSIONS

- The first bacterial strains isolated from the perennial ice accumulated since Late Glacial period in Scarisoara Cave.
- The first characterization of a climate-dependent antibiotic resistance profile from a cave.
- The first culture-based evidence of the existence of bacterial resistome and antimicrobial compound production from this type of icy environment.
- Promising candidates for understanding the evolution of environmental resistome and discovering new antimicrobial agents

FUNDING: ERANET-MARTERA-MOBILTOX-2-224